P. 229, the 17th line of the footnote should be

$$\frac{4a^2}{2}\delta_b + 5ab\delta_c + 6\left(ac + \frac{b^2}{2}\right)\delta_d + 7(ad + bc)\delta_e.$$

P. 229, line 21 of footnote, for $\frac{c^2}{2}$ read $\frac{b^2}{2}$.

P. 229, the 22nd line of the footnote should be

$$4a^2\delta_b + 5(ab + ba)\delta_c + 6(ac + b^2 + ca)\delta_d + 7(ad + bc + cb + da)\delta_e + \ldots$$

P. 230, for πραγματων read πραγματων.

P. 230, 2nd column, line 10 from bottom, for "Buckkeim" read "Buchheim."

P. 231.—The greater circle has been erroneously represented as cutting the ellipse. It should pass outside it, thus—

and its centre should be indicated by an asterisk, as well as that of the smaller circle.

P. 231, Chart 5, and p. 226, the syzygy should be in both places

$$(n-1)^2\left(\frac{d\Phi}{dy}\right)^3 a + n(n-1)\left\{\frac{d^2\Phi}{dx^2}\cdot\frac{d^2\Phi}{dy^2} - \left(\frac{d^2\Phi}{dxdy}\right)^2\right\}\Phi = z^2 H.$$

P. 231, Chart 2, in the last binariant Protomorph but one, for + 5*abe*, read − 5*abe*.

Chart 6, last line but one, for $H + \Lambda U$ read $H = \Lambda U$.

For "Boole-Mongian" read "Boolo-Mongian" *passim*.

Those desirous of obtaining systematic information on the subject of the lecture may consult the following recent articles from the pen of its author, viz. one on "Schwarzian Derivatives," followed by another on "Reciprocants" in the *Mathematical Messenger*, four "Sur une nouvelle théorie de formes algébriques," a fifth "Sur les Invariants Différentiels," which have already appeared, and a sixth "Sur les réciprocants purs irréductibles du quatrième ordre," about to appear in the *Comptes rendus* of the Institute.

It may be as well to mention that the papers in the *Messenger* were given in long after the dates which the numbers of the *Messenger* bear on their cover, those dates being by some months anterior to the time of their actual issue. In the absence of this explanation the theory would appear to have been in print long before the time when it is stated to have been discovered.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE

OXFORD.—Prof. Stirling succeeds Dr. Gamgee as an examiner in the Honour School of Natural Science, not Prof. Burdon-Sanderson, as stated last week.

CAMBRIDGE.—Mr. A. E. Shipley, B.A., Scholar of Christ's College, has been appointed Demonstrator of Comparative Anatomy. Mr. Shipley was placed in the first class in the Natural Sciences Tripos Part II., for Zoology and Comparative Anatomy.

It is recommended by the Council of the Senate that the University should now take over the machinery and other plant of the Engineering School belonging to Prof. Stuart. In 1883 its value was estimated at 2500*l*. It has since been considerably added to. Out of the receipts from students' fees and for payments for work done for University departments and private persons, the machinery has been kept in good repair, 10 per cent. has been set aside each year for depreciation, and 5 per cent. has been paid upon the capital, and in addition a profit of 100*l*. was made last year.

SCIENTIFIC SERIALS

The American Journal of Science, January 1886.—Observations on invisible heat-spectra and the recognition of hitherto unmeasured wave-lengths made at the Alleghany Observatory, by S. P. Langley. It is agreed that all cold bodies must not only radiate heat to still colder bodies, but, according to our present conception of radiant energy, be also capable of giving a spectrum, whether we can recognise it or not. The object of the present paper is to describe the actual formation of such spectra and the recognition of their heat in approximate terms of wave-lengths. From the author's researches it is inferred that some of the heat radiated by the soil has a probable wave-length of over 150,000 of Ångström's scale, or about twenty times the wave-length of the lowest visible line in the solar spectrum as known to Fraunhofer.—Botanical necrology of 1885, by Asa Gray. Obituary notices are here given of Charles Wright, of Wethersfield, Connecticut (1811-1885); George W. Clinton, of Albany, New York (1807-1885); Edmond Boissier, of Geneva (1810-1885); and Johannes August Christian Roeper, of Basle (1801-1885).—The isodynamic surfaces of the compound pendulum, by Francis E. Nipher. It is generally assumed that particles near and below the axis of suspension are retarded, and those near the bottom of the pendulum accelerated, by reason of their connection with the system, while the series of particles forming the axis of oscillation are neither accelerated nor retarded. But although this may be true as regards the time of a complete oscillation, it is shown that in any compound pendulum the particles near the bottom do not exert a constant retarding effect upon the system.—The peridotites of the "Cortlandt Series" on the Hudson River, near Peekskill, New York, by George H. Williams. In his paper the author gives a petrographical description of the most basic members of that most interesting group of massive rocks which occurs on the southern flank of the archæan highlands about forty miles north of the city of New York.—Description of a meteorite from Green County, Tennessee, by Wm. P. Blake. This mass of meteoric iron, which was found by a farmer ploughing his field in 1876, and is now in the writer's collection, weighs 290 pounds, is of the shape of a flattened cigar, 36 inches long, 10 broad, and 6 thick. It clearly belongs to the class of exfoliating deliquescent irons, several examples of which have been found in Tennessee, Georgia, and North Carolina. A quantitative determination of a small slice from one end by Baumhauer's method gave iron 91·421, nickel 7·955.—Tendril movements in *Cucurbita maxima* and *C. Pepo*, by D. P. Penhallow. In his paper, which is not concluded, are contained the results of a study made some years ago on the movements of the squash tendrils and terminal bud. Subsequent discoveries touching the continuity of protoplasm have served to give a clue to certain phenomena observed during the researches, but which at the time could not be satisfactorily accounted for. This clue was followed up during last summer, with the result that the true explanation of the tendril movement in *Cucurbita*, and possibly also in the whole family of *Cucurbitaceæ*, appears to have been reached from histological research.

Bulletin de l'Académie Royale de Belgique, November 1885.—Solution of Wrouski's universal problem, and of another problem relating to the integration of differential equations, by Ch. Lagrange. This is the fifth memoir devoted by the author to the elucidation and correction of Wrouski's writings. Here he demonstrates and generalises for any number of variables, the following theorem: Given a differential equation of any order n:

$$\phi\left(\frac{d^n x}{dt^n}, \frac{d^{n-1}x}{dt^{n-1}}, \ldots \frac{dx}{dt}, x, t, a\right) = 0,$$

between the dependent variable x and the independent variable t (a being a parameter), an equation which may be integrated for $a = 0$, the coefficients of the development of x according to the powers of a are absolutely known functions of t given by simple quadratures.—Researches on the spawning of the toad (*Bufo vulgaris*), and on the protecting layers of the egg in the batrachian family generally, by M. Héron-Royer.—Note on the origin of diastase and on the reduction of the nitrates to nitrites, by M. Ed. Jorissen. The author's experiments tend to confirm the views of Traube and Pfeffer, who regard the physiological character of the Bacteria and of the Mycetæ in general as profoundly different from that both of plants and animals. He further endeavours to show that the reduction of nitrates to nitrites by germinating grains must be attributed to the presence of the Bacteria of putrefaction in the surrounding fluid.—Experimental researches on the influence of magnetism on polarisation in the dielectrics, by Edmond van Aubel. The object of these researches is to ascertain whether it be possible to establish a parallelism between the electro-magnetic rotation of the plane of polarisation of light, the phenomena of the reflection of light on a magnet, and Hall's discovery. But the result so far has been unsatisfactory.—Note on the late Gen. Baeyer's views regarding an annual oscillation in the level of the Baltic Sea, by Gen. Liagre. Even admitting the accuracy of the observations

tending to show that in the Baltic the tides rise higher in summer than in winter, the author is disposed to attribute the phenomenon rather to local physical causes than to Baeyer's astronomic theory of solar action.—Note on the geological formation of the Juan Fernandez islands, by A. L. Renard. The prevailing rocks throughout this group would appear to be mainly basaltic, with little or no trace of lavas or other recent eruptive matter.—On some new groups of fossil remains from the Upper Chalk and Lower Eocene Tertiary formations of Belgium, by Ed. Dupont. These specimens, now mounted in the Brussels Museum of Natural History, include fragments of a Dinosaurian (*Orthomerus dolloi*) from the Maestricht district; the head and various bones of the gigantic *Mosasaurus camperi*, from Limbourg and Montague Sainte-Pierre; remains of a new type of Mosasaurian recently described by M. Dollo under the name of *Plioplaticarpus marshi*, from Maestricht; remains of another Mosasaurian from Ciply, new in Europe, but well known in America, which M. Dollo has named *Polygonodon ciplyensis*; the carapaces of two large turtles from Maestricht, *Chelonia hoffmanni*, Gray, and *Ch. suyderbuycki*, Ubags; lastly, the skull of a crocodile affiliated by Dollo to the *Crocodilus affinis* discovered by Marsh in the Eocene of the far west.—Note on the whale captured last May off Fécamp, by P. J. van Beneden. At first supposed to be a *Balænoptera musculus*, L., or else a new species, the author shows that this cetacean is the *Balænoptera rostrata*, Fabricius, a specimen of which was taken in 1878 near Villefranche in the Mediterranean.—A study of François Huet and his philosophic writings, by O. Merten.

SOCIETIES AND ACADEMIES

LONDON

Royal Society, January 7.—"Contributions to the Anatomy of the Central Nervous System of the Plagiostomata." By Alfred Sanders, M.R.C.S., F.L.S. Communicated by Dr. Günther, F.R.S. (Abstract.)

After referring to the literature of the subject, and describing the macroscopic aspect of the brain, and partly the distribution of the cranial nerves, the author proceeds to give an account of the histology of the segments of the brain.

The olfactory lobes are well developed. They present three layers. Internally cells of the smallest category are found; they give off several processes which join a network penetrating the whole layer; through the medium of this network these cells communicate with the glomeruli which form the middle layer. These glomeruli are much better developed than in the Teleostei; here they present a central core of closely intertwined fibrillæ inclosed externally by fibrils of a larger size, in the course of which cells are developed; these are arranged parallel to the long axes of the glomeruli, and join the external layer, which consists of fibres passing from the anterior end of the olfactory lobe to supply the olfactory organ.

In the Rays these lobes are solid, but in the Scyllium, Rhina, and Acanthias they contain a ventricle which communicates through a long peduncle with the ventricles of the cerebrum.

The cerebrum presents externally a layer of neuroglia without cells, or at least with comparatively few; the remainder of the parenchyma presents cells of a medium size which are usually distributed in groups with neuroglia interspersed between them; these groups in Scyllium contain from nine to fifteen cells, in the Rays generally more. Four special groups of cells occur towards the base of the brain, two in the outer and two in the inner walls: from the former arise the anterior commissure, and from the latter the crura cerebri.

Two ventricles occur in the cerebrum of Scyllium, Rhina, and Acanthias which homologise with the lateral ventricles in the cerebrum of Mammalia. At the posterior part they coalesce into one chamber which is in communication with the third ventricle; this chamber is evidently the foramen of Monro. Dr. Wilder is of opinion that the ventricles of the olfactory lobes represent the lateral ventricles, and that their apertures of communication with the above-mentioned chambers homologise with the foramina Monroi. A consideration of the case renders this idea improbable. In the Rays the ventricles are reduced to a very small chamber occupying the posterior end of the cerebrum.

The crura cerebri form two projecting walls of a gutter-shaped passage which communicates with the third ventricle. As Prof. Owen has already pointed out, they probably homologise with the nervous cords which connect the supra- with the infra-œsophageal ganglia in Invertebrata; and it is through the third ventricle that the œsophagus of the probable invertebrate ancestor of the Vertebrata could have reached the present dorsal surface without breaking through nervous tissue; for dorsally the choroid plexus and pineal gland cover in this ventricle, there being no nervous tissue here, and inferiorly it communicates through a chamber in the hypoarium with a chamber in the centre of the pituitary body; the endothelium lining the former being continuous with the endothelium lining of the latter.

The optic lobe which arches over the aqueduct of Sylvius corresponds to the tectum lobi optici of the Teleostei; the structure is much simpler, although comparatively speaking the lobe is larger. Externally it is occupied by the fibres of origin of the optic nerve; within these a transverse commissure is visible homologising with the transverse commissure in the tectum lobi optici of Teleostei. Internally a ganglion of large cells occurs variously arranged in the different species; these cells are of large size, but differ from the cells of the ventral horn of grey matter of the cord in texture, and in the fact of giving off only one process as a rule, which process runs into the above-mentioned transverse commissure. Numerous cells of small size, many of which are fusiform, occur in this lobe; these are more numerous in the centre.

The author's researches do not bear out the statement of Rohon that the thalamencephalon projects backward and covers the mesencephalon in the optic lobe; so that according to this author it is composed of both these segments of the brain. Apart from embryological considerations, which give no countenance to this idea, there is nothing in the structure of this lobe which indicates an origin from two distinct primary vesicles of the brain; on the contrary, its structure is homogeneous.

The cerebellum presents a structure corresponding to that in the Teleostei. There are, counting from within outward, the granular, fibrous, Purkinje cells, and molecular layers. The differences consist in the greater number of processes given off by the Purkinje cells, and in the greater number of small cells found in the molecular layer. Another difference is found in the presence of a ventricle which is largest in Rhina, Acanthias, and Scyllium, and reduced to very small dimensions in the Raja.

The molecular layer is continued down on to the surface of the medulla oblongata from the cerebellum, forming the restiform bodies. In the spinal cord there are distinguishable three columns on each side: a dorsal above the dorsal cornu, a lateral at the side, and a ventral beneath; the latter consists of fibres of a larger calibre than those constituting the other columns, but no gigantic fibres—the so-called Mauthner's fibres—are present, as in the Teleostei.

The deep origins of the cranial nerves. The optic nerve arises as above-mentioned from the outer half or more of the optic lobes, also by a few fibres from the hypoarium. This fact was contradicted by Bellonci in reference to the origin of this nerve in Teleostei, but further researches and consideration compel the author to adhere to his original statement.

The oculomotor arises from a ganglion in the floor of the aqueduct of Sylvius. There is no decussation of the fibres of origin of this nerve as is stated by some authors; the error probably arose from the presence in this region of a decussation of fibres derived from the transverse commissure in the optic lobe: this decussation of fibres corresponds to the commissura ansulata in Teleostei.

The facial arises from a small bundle of fibres which comes forward from the lateral columns of the cord, and is situated at the side of and slightly above the central canal.

The trifacial arises from a tuberosity overhanging the fourth ventricle immediately contiguous to the restiform bodies, also from the grey matter of the floor of that ventricle.

The vagus arises from a series of rounded tubercles which occupy the lateral portions of the floor of the fourth ventricle.

Linnean Society, January 21.—W. Carruthers, F.R.S., Vice-President, in the chair.—Mr. Harry Veitch exhibited, in illustration of Dr. Masters's paper, a series of living conifers, among which were: *Abies Fortunei*, *A. nobilis*, *A. grandis*, and *A. amabilis*; also *Pseudolaryx Kæmpferi*, *Picea Omorika*, *Pinus Pencei*, *Arthrotaxis selaginoides*, and others.—Mr. E. M. Holmes exhibited a specimen of the ergot of Diss (*Arundo tenax*) from Algeria. This ergot is said to be more active medicinally than that of Rye, and is slenderer and twice or thrice its length, and is attributable to the fungus *Claviceps purpurea*.—Dr. C. Cogswell drew attention to dried specimens of the species of maples (*Acer*) of Canada collected by him in Nova Scotia, and of *Sisy-*